

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION AND
THE UNIVERSITY OF MARYLAND CENTER FOR ENVIRONMENTAL SCIENCE

2020 National Status Report Scoring Methodology

Basin-wide and theme calculations and scoring
for the national coral reef status report

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BACKGROUND

The National Oceanic and Atmospheric Administration Coral Reef Conservation Program (NOAA CRCP) invests significant funds to support the National Coral Reef Monitoring Program (NCRMP) throughout the U.S. Pacific, Atlantic, Caribbean, and Gulf of Mexico coral reef areas. A key component of this program is periodic, national-level assessment on the status and trends of U.S. coral reef areas. To develop and implement this report framework, NOAA CRCP partnered with the Integration and Application Network (IAN) at the University of Maryland Center for Environmental Science (UMCES). The framework, termed herein as status report, is based on the timely and transparent assessment of biophysical and human dimension indicators against references that are synthesized into overall condition scores for each coral reef jurisdiction. The primary purpose of the CRCP status report products is to communicate the status and trends of U.S. coral reefs to Congress, NOAA leadership, and the interested public. Nine jurisdiction status reports were released in 2018 and 2020: Northern Mariana Islands, Guam, American Samoa, Pacific Remote Islands, Hawaii and the Northwest Hawaiian Islands, Flower Garden Banks, Puerto Rico, U.S. Virgin Islands, and Florida. The purpose of this document is to describe the additional analyses taken to synthesize and summarize the results from the nine individual reports into an overall national status report for all U.S. coral reefs. This is the concluding product in this cycle of collaboration between NOAA CRCP and UMCES IAN.

INDICATOR DEVELOPMENT

NOAA's National Coral Reef Monitoring Program defines four main monitoring data themes in its monitoring plan (NOAA, 2014). The four monitoring themes are fish, corals and algae, climate, and human connections, and each has associated indicators (NOAA, 2014). During the initial workshops for each of the jurisdictional reports, presentations of available data were given by experts followed by breakout sessions to determine appropriate indicators for these products within each theme (fish, corals and algae, climate, and human connections). The criteria which experts used to choose indicators were: 1) data availability, 2) sufficient understanding of reference/baseline/historical conditions, and 3) importance to overall ecosystem health. These indicators were refined over months of discussion between NOAA scientists and local experts from the jurisdictions. Detailed calculations and analyses can be found in Donovan et al. 2018 for the Pacific jurisdictions and Donovan et al. 2020 for the Atlantic jurisdictions.

As with the nine individual jurisdictional reports, the national report process began with a workshop to determine what analyses would and would not be appropriate for a report synthesizing all the data at the national level. Workshop participants included representatives that had knowledge of each of the four indicator categories in each of the jurisdictions.

Example of indicators, categories, and scoring system from the Atlantic status reports.

Indicators	Indicator categories		Scoring system for all indicators
Coral cover	Corals and algae		<p>What do the scores mean?</p> <p>90–100% Very good</p> <p>All or almost all indicators meet reference values. Conditions in these locations are unimpacted, or minimally impacted or have not declined. *Human connections are very high.</p> <p>80–89% Good</p> <p>Most indicators meet reference values. Conditions in these locations are lightly impacted or have lightly declined. *Human connections are high.</p> <p>70–79% Fair</p> <p>Some indicators meet reference values. Conditions in these locations are moderately impacted or have declined moderately. *Human connections are moderate.</p> <p>60–69% Impaired</p> <p>Few indicators meet reference values. Conditions in these locations are very impacted or have declined considerably. *Human connections are lacking.</p> <p>0–59% Critical</p> <p>Very few or no indicators meet reference values. Conditions in these locations are severely impacted or have declined substantially. *Human connections are severely lacking.</p> <p> Insufficient data, not scored</p>
Macroalgae and Crustose coralline algae cover			
Adult coral (density)			
Herbivory			
Mortality			
Diversity			
Reef fish	Fish		
Sustainability			
Diversity			
Temperature stress	Climate		
Ocean acidification			
Reef material growth			
Awareness	Human Connections		
Support for management actions			
Pro-environmental behavior			

Indicator scoring process

For the national coral reef status report, there were two main analyses performed: comparing jurisdictional scores between ocean basins and comparing indicators between populated and remote areas.

Populated and remote area indicators

We performed a meta-analysis that broadly compared results from populated and remote jurisdictions. We determined that the populated jurisdictions included the Commonwealth of the Northern Mariana Islands, Guam, American Samoa, Hawaii, Puerto Rico, U.S. Virgin Islands, and Florida. While there are unpopulated areas of those jurisdictions, the four categories were not broken down beyond jurisdictional boundaries because that was not the original intention of the indicator scoring process or calculations. We wanted to perform a meta-analysis that compared populated and remote areas broadly. We determined that remote jurisdictions included the Pacific Remote Islands, Northwest Hawaiian Islands, and Flower Garden Banks. The areas defined as remote are also areas with few to no human inhabitants, and do not receive human connections surveys (see Donovan et al. 2018, 2020 for further details).

Each of the three categories (corals and algae, fish, and climate) were evaluated for potential comparisons between populated and remote areas. As mentioned above, this ‘populated versus remote’ analysis was not applicable to human connections indicators, as there are no human connections data collected in the remote jurisdictions.

Comparisons within the climate category were made, but there were no substantial differences in overall climate scores between populated and remote areas. This finding makes sense because climate is a global issue, affecting both populated and remote areas equally; remote areas are not refugia from climate change stressors.

Comparisons within the corals and algae category were determined to be inappropriate, because some indicator data were collected differently by the Pacific and Atlantic jurisdictions, and/or were scored differently in the Pacific and Atlantic status reports.

Comparisons within the fish category provided some insights into populated versus remote areas because human activities have direct and indirect effects on coral reef fish populations and communities, through fishing activities and habitat and environmental degradation. The data that informs these new remote vs. populated fish scores were derived from averaging the previously-released jurisdictional report overall fish scores for each region. Two score wheels were created. The populated wheel is an average score of all the populated region fish scores, and the remote wheel is an average score of all the remote region fish scores. All fish data used were previously released in the jurisdictional reports. The steps taken to analyze the fish scores for populated versus remote areas were:

1. Take the overall fish score (see table below) for each populated jurisdiction and area-weight it with the total reef amount for that jurisdiction. See Donovan et al. 2018 and Donovan et al. 2020 for reef areas for the Pacific and Atlantic jurisdictions, respectively.
2. Sum the area-weighted scores for populated jurisdictions.
3. Round to the nearest whole number.
4. Repeat these steps for remote jurisdictions (see second table below).
5. Compare those overall scores on the same scoring system as individual jurisdictional reports (see table above for scoring categories).

Populated jurisdictions' overall fish scores and calculation of overall populated fish score.

Jurisdiction	Fish score	Area (km²)	Proportion	Sum
American Samoa	73	62	0.01659973226	1.211780455
Guam	66	51	0.01365461847	0.9012048193
N. Mariana Islands	76	105	0.0281124498	2.136546185
Main Hawaiian Islands	66	974	0.02607764391	17.21124498
Puerto Rico	63	995	0.266398929	16.78313253
U.S. Virgin Islands	64	358	0.09585006693	6.134404284
Florida	73	1190	0.3186077644	23.2583668
Total		3735	1	68

Remote jurisdictions' overall fish scores and calculation of overall remote fish score.

Jurisdiction	Fish score	Area (km²)	Proportion	Sum
Pacific Remote Islands	93	128	0.1230890545	11.44728206
Flower Garden Banks	85	0.8975	0.000863065831	0.0733605956
Northwest Hawaiian Islands	91	911	0.8760478797	79.72035705
Total		1040	1	91

Ocean basin comparison process

Throughout the jurisdictional status report process and the national status report in-person workshop, there was a lot of discussion about if and how to compare jurisdictions to each other, and whether it would be appropriate to create one overall score for U.S. coral reefs. Ultimately, the working group determined that it would not be appropriate to combine Pacific and Atlantic jurisdiction scores because the ecology, biogeochemistry, geology, human development, economy, and cultures in the Pacific and Atlantic jurisdictions were too disparate, and because some indicators were derived slightly differently in the Pacific and Atlantic jurisdictions.

However, because the physical and cultural differences were similar among Pacific and Atlantic jurisdictions, and because data analyses were performed similarly within the jurisdictions in the Pacific region, and within the Atlantic region, the working group felt that it would be appropriate to create an overall score for Pacific coral reefs and an overall score for Atlantic coral reefs. The data that informs these new scores were derived from averaging the previously-released jurisdictional report scores for each region. In other words, the Pacific wheel is an average score of all the Pacific region scores, and the Atlantic wheel is an average score of all the Atlantic region scores. This was a meta-analysis of available scores, and no new data were used that were not already released in the jurisdictional reports.

The steps taken to analyze the overall scores for ocean basins were:

1. Take the overall jurisdictional score (see table below) for each Pacific jurisdiction and area-weight it with the total reef amount for that jurisdiction. See Donovan et al. 2018 and Donovan et al. 2020 for reef areas for the Pacific and Atlantic jurisdictions, respectively.
2. Sum the area-weighted scores for Pacific jurisdictions.
3. Round to the nearest whole number.
4. Repeat these steps for Atlantic jurisdictions (see second table below).
5. Compare those overall scores on the same scoring system as individual jurisdictional reports (see table above for scoring categories).

Pacific basin jurisdictions' overall scores and calculation of overall Pacific basin score.

Jurisdiction	Overall score	Area (km²)	Proportion	Sum
American Samoa	80	62	0.0277902286	2.22
Guam	71	51	0.02285970417	1.62
N. Mariana Islands	78	105	0.04706409682	3.67
Main Hawaiian Islands	70	974	0.4365755267	30.56

Northwest Hawaiian Islands	76	911	0.4083370686	31.03
Pacific Remote Islands	82	128	0.05737337517	4.704
PACIFIC		2231		73.8

Atlantic basin jurisdictions' overall scores and calculation of overall Atlantic basin score.

Jurisdiction	Overall score	Area (km ²)	Proportion	Sum
Flower Garden Banks	89	0.8975	0.0003528050953	0.0314
Puerto Rico	70	995	0.3911321113	27.38
U.S. Virgin Islands	72	358	0.1407289405	10.13
Florida	69	1190	0.4677861431	32.28
ATLANTIC		2544		69.8

SUMMARY

A coral reef status report addresses the need to summarize and communicate coral reef monitoring and assessment in U.S. jurisdictions to decision-makers, policy-makers, and the public. This assessment provides the status of U.S. coral reef areas to track change over time and evaluate ecosystem condition. This methods document explains the scoring process for the National U.S. Coral Reef Status Report. The criteria which experts used to choose indicators were: 1) data availability, 2) sufficient understanding of reference conditions, and 3) importance to overall ecosystem health. These indicators and scoring processes were refined over months of discussion between different groups, jurisdictions, and NOAA headquarters. This report of U.S. coral reef condition summarizes the individual indicator, category, and jurisdiction assessments. These new analyses provide insights at a broad scale, communicating high level messages to the public and policy makers. The national status report is the culmination of a five-year collaboration between CRCP, UMCES' Integration and Application Network, and numerous partners in every jurisdiction from state and territorial governments, academia, and non-governmental organizations. We synthesized data from six years (2012-2018) in four theme areas: corals and algae, fish, climate, and human connections across all nine U.S. coral reef areas. This represents a scientific meta-analysis that may be the first of its kind at a national scale. This methods document should be used to understand the process by which the individual jurisdictional and themes were synthesized into a national assessment.

LITERATURE CITED

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